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Amitava Sengupta

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**BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES**

Application Number: 10/812,450
Filing Date: March 30, 2004
Appellant(s): SENGUPTA ET AL.

Jeffrey C. Watson
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 4/25/08 appealing from the Office action mailed 11/15/07.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

4,623,460	KUZUMOTO	9-1986
6,616,847	CHO	9-2003

2003/0154856

ANDERSON

8-2003

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

1. Claims 1,3-8 and 10-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cho et al (US 6,616,841), with evidence from Kuzumoto (US 4,623,460); and alternately, over Kuzumoto in view of Cho.

Cho teaches a hollow fiber membrane cartridge and a system for degassing as claimed – see figures, especially figure 4. The membrane is in the form of a fabric (abstract), and is wound around the perforated central tube (12). The membrane lumen is open only on one end in figure 4. The center tube is plugged on one end (by the tube sheet (26), but is not the same end as claimed (the orientation of the center tube in the Cho reference is reversed compared to that of the applicant's), which eliminates an end cap in the reference figure 4. . However, this difference in the claims is only an obvious equivalent of the teaching of the reference unless applicant can show otherwise, with evidence. An express suggestion to substitute one equivalent component or process for another is not necessary to render such substitution obvious. In re Fout, 675 F.2d 297, 213 USPQ 532 (CCPA 1982). Also, a mere reversal of parts (In re Gazda 219 F.2d 449, 104 USPQ 400 (CCPA 1955) or rearrangement of parts (In re Japikse, 181 F.2d 1019, 86 USPQ 70 (CCPA 1950) and In re Kuhle, 526 F.2d 553, 188 USPQ 7 (CCPA 1975) is unpatentable. This construction of having the perforated tube plugged

at the first end cap and attached from the second end cap, and lumen of the hollow fibers open at the first end cap is taught by Kuzumoto (US 4,623,460), and is already known in the art.

With respect to the newly added limitation in the RCE of 7/23/07, i.e., the first and second head spaces, Cho's figure 4 does not show an end cap on the second end, and therefore the second head space, where the lumen of the hollow fibers are closed, because an end cap is not necessary at that end. An end cap can be added to the second end where the lumen of the hollow fibers are closed, if one were to change the orientation of the feed inlet tube (20) to have the feed inlet form that end, as is contemplated by the applicant, which would be obvious to one of ordinary skill in the art. Such design is also known in the prior arts, as evidence by Kuzumoto. It is also not patentable: a mere reversal of parts (In re Gazda 219 F.2d 449, 104 USPQ 400 (CCPA 1955) or rearrangement of parts (In re Japikse, 181 F.2d 1019, 86 USPQ 70 (CCPA 1950) and In re Kuhle, 526 F.2d 553, 188 USPQ 7 (CCPA 1975) is unpatentable.

The Cho reference teaches a system for degassing as claimed. The recitation of the liquid in the claim is not a patentable limitation. "Expressions relating the apparatus to contents thereof during an intended operation are of no significance in determining patentability of the apparatus claim." Ex parte Thibault, 164 USPQ 666, 667 (Bd. App. 1969). Furthermore, "[i]nclusion of material or article worked upon by a structure being claimed does not impart patentability to the claims." In re Young, 75 F.2d 966, 25 USPQ 69 (CCPA 1935) (as restated in In re Otto, 312 F.2d 937, 136 USPQ 458, 459 (CCPA 1963)).

The material of the shell, end caps, tube sheets, and plug being of the same material such as polyethylene is well known in the art as taught by Cho, and the reference incorporated by Cho (column 1 lines 8-12: US Patent 5,284,584: Huang et al: see abstract and column 1 lines 10-28 and column 5 lines 10-29: tube sheet, and other components of the cartridge made from polyolefin).

The dimensions such as length and diameter are not patentable limitations. *In re Rose*, 220 F.2d 459, 105 USPQ 237 (CCPA 1955) (Claims directed to a lumber package “of appreciable size and weight requiring handling by a lift truck” where held unpatentable over prior art lumber packages which could be lifted by hand because limitations relating to the size of the package were not sufficient to patentably distinguish over the prior art.); *In re Rinehart*, 531 F.2d 1048, 189 USPQ 143 (CCPA 1976) (“mere scaling up of a prior art process capable of being scaled up, if such were the case, would not establish patentability in a claim to an old process so scaled.” 531 F.2d at 1053, 189 USPQ at 148.). *In Gardner v. TEC Systems, Inc.*, 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), cert. denied, 469 U.S. 830, 225 USPQ 232 (1984), the Federal Circuit held that, where the only difference between the prior art and the claims was a recitation of relative dimensions of the claimed device and a device having the claimed relative dimensions would not perform differently than the prior art device, the claimed device was not patentably distinct from the prior art.

The baffle (claims 6,13) in the cartridge is taught by the reference – see baffle 50, figure 3. While figure 4 may not be showing the baffle, it would be obvious to one of ordinary skill in the art at the time of invention to have the baffle for the reason

suggested by the reference, i.e., distribution of the fluids around the hollow fibers – see column 4 lines 40-45.

End caps welded to the shell is also not patentable – it is a process limitation in the product claim. “[E]ven though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process.” In re *Thorpe*, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985).

Finally, “for introducing a gas into a liquid” in claim 14 is an intended use limitation. A claim containing a “recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus” if the prior art apparatus teaches all the structural limitations of the claim. *Ex parte Masham*, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987). Liquid and gas recited are contents in the apparatus for the process: *Ex parte Thibault*. Using hollow fibers to gasify a liquid is also known in the art as evidenced by Katou, et al (US 6,158,721).

Regarding claims 15 – 18, the shell opening in figure 4 is equivalent to the claimed shell opening at the mid point. Applicant has not disclosed any criticality of having the shell opening exactly at the mid point of the shell, instead of what is taught by figure 4.

Claims 19-22 are broader than the corresponding claims 1, 7,8 and 14, and are unpatentable as shown.

Alternately, the claims are unpatentable over Kuzumoto in view of Cho.

Kuzumoto teaches a cartridge (figure 1) with a shell, first end cap (at 5) with first tube sheet (3), hollow fibers with lumen open at first end cap (5a), second end cap and second tube sheet (3') with lumen of the hollow fibers closed at second end cap (see abstract and column 1, lines 30-59), a perforated tube (8) which is plugged at the first end cap and open to the outside (7) at the second end cap for feed inlet, and a nozzle (9) on the shell for the non-permeate exit. Permeate taken out from the lumen of the hollow fibers through outlet (10).

With respect to the end caps being exclusive to the respective ends, Kuzumoto teaches such exclusivity as claimed and as disclosed by the applicant. See the end caps at both ends of figure 1.

Claims differ Kuzumoto in the hollow fiber fabric and all parts constructed of the same material, and the second tube sheet being sealed to the second end cap. Cho teaches a similar membrane cartridge with hollow fiber fabric wound around the perforated tube and that all parts of the cartridge can be made of the same material as shown above. It would be obvious to one of ordinary skill in the art at the time of invention to use the teaching of Cho in the teaching of Kuzumoto because the Cho construction would afford mechanical support for, and uniform spacing between, the hollow fibers, and choice of material as taught by Cho (incorporated reference to

Huang) for chemical and temperature resistance for wider range of applicability.

Remaining limitations in the independent claims are intended-use. Cho teaches the limitations in the dependent claims, as explained above.

Response to arguments of 10/10/07 traversing this rejection:

Applicant has only one point of contention on the rejection, that the limitation:

“said second end cap being adjoined to said second end of said shell where said second end cap and said second tube sheet defining a second head space therebetween; said second end cap opening being in communication with said center tube via said second head space”

This limitation is represented by head space (32) in applicant's figure 1 copied below:

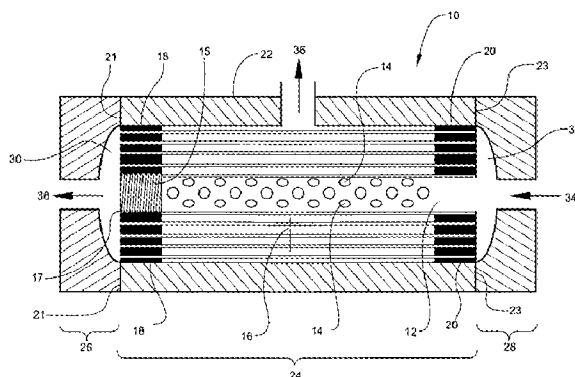
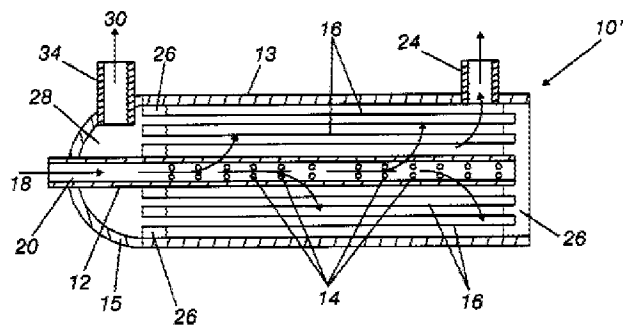


Fig. 1

As can be observed in the Fig 1 above, second end cap (28) is attached to the shell and the tube sheet (20) at (23) and opening (34) of the end cap communicates with the center tube (12) through headspace (32). An external connection may be made to the opening (34) of the end cap.

In the Fig. 4 of Cho copied below, there is no second end cap and second head space, as is discussed in the rejection. However, if one were to reverse the orientation of the center tube (12) in Cho, the open end of the center tube would be at the right side of the Fig. 4, and the center tube would extend, or could be extended, for an external connection, and thus an end cap and a head space as shown in applicant's Fig. 1 is not necessary (or redundant). Such a reversal of the orientation of the center tube would be obvious to one of ordinary skill in the art.

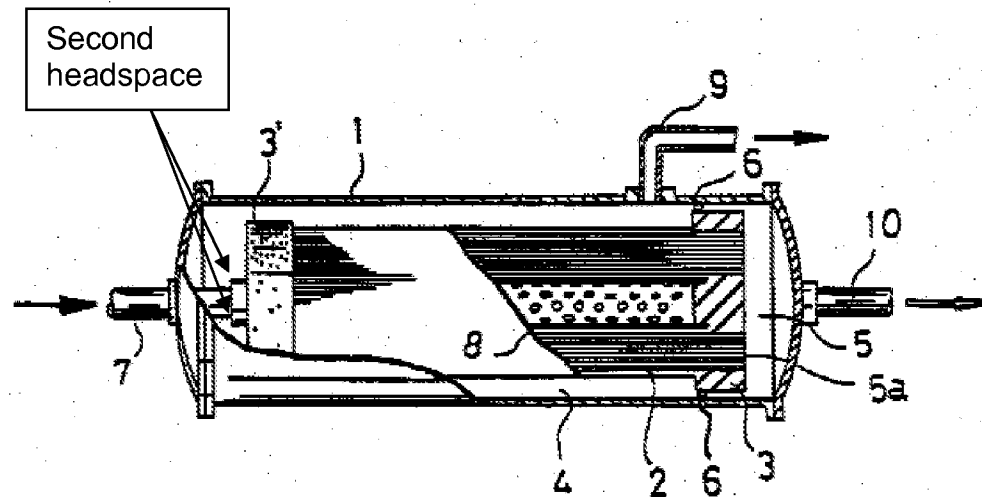
Fig.4



Applicant's arguments with respect to the Cho reference is also not commensurate in scope with the rejection, because, what applicant identified as the second head space in Cho's Fig. 4 would be the first head space.

Now, with respect to Kuzumoto, Fig. 1 of Kuzumoto is copied below.

FIG. 1



The second headspace as applicant recites in the claim is at the left end of Fig. 1 of Kuzumoto. As can be seen in the figure, the hollow fibers have closed ends at tube sheet (3'), and the center tube (8) is open to external connection at this end through the connector tube (7), which is part of that end cap and which is attached to the tube sheet (3').

The space between the resin layer (3') and the end cap on the left is a headspace. Also, giving the broadest reasonable interpretation of the claim language, the space inside tube (7) can be considered as the second head space.

Also, the center tube (8) is in communication with the opening of the end cap (through which tube 7 is inserted) via the head space outside of tube (7) because tube (7) passes through this head space.

Applicant's argument that Kuzumoto does not define the second head space is not persuasive. The claim defines the second head space as between the tube sheet and the end cap. There is a head space between the tube sheet and the end cap in Kuzumoto. This part of the argument is not commensurate in scope with the claims.

2. Claims 1,3-8 and 10-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Anderson (US 2003/0154856) in view of Cho et al (US 6,616,841), or in the alternative, Cho in view of Anderson

Anderson teaches a hollow fiber membrane cartridge (30-figure 3) having a perforated center tube (37), hollow fibers (9) open at the first tube sheet (at 6) end and closed at the second tube sheet (12) end, center tube open to fluid flow at second tube sheet (12) through port (15), and plugged at the first tube sheet end (see the description at paragraph 0025), shell has a port (16) for fluid communication to the shell side, end caps (6 and 7) forming first and second head spaces as claimed, the shell is sealed to the end caps and tube sheets (O-rings 3), and permeate outlet through port (14) at the first tube sheet from the first head space. The apparatus is capable of introducing fluid through port (15) in to the shell and removing the retentate through port (16) as claimed. Even if not, the change in direction of flow is not a patentable invention because the flow in the reverse direction as taught in the reference would be equivalent and would provide predictably same results as the in the claimed flow direction. KSR v Teleflex: 82 USPQ 2d 1385 (2007).

Claims differ from the teaching of Anderson in the hollow fiber fabric and the material of shell, end caps, tube sheets, center tube and the plugs being the same. Cho teaches these features, as shown in the paragraph 1 above. It would be obvious to one of ordinary skill in the art at the time of invention to use the teaching of Cho in the teaching of Anderson for reinforcement/mechanical strength for the hollow fibers, maintaining proper spacing between the fibers, providing chemical resistance, etc.

Claim limitations reciting introducing a gas in to a liquid or degassing a liquid are intended use, which the apparatus is capable of.

Limitations of the dependent claims are taught by the references singly or in combination (see paragraph 1 above).

Alternately, it would be obvious to one of ordinary skill in the art at the time of invention to use the teaching of Anderson in the teaching of Cho to have the Cho cartridge in applications as recited by Anderson. It would also be obvious to one of ordinary skill in the art at the time of invention to reverse the arrangement of the opening (18) of the perforated tube with respect to the open end of the hollow fibers (at 26) of figure 4 of Cho as in the Anderson design because such a change would afford equivalent structures with predictably no difference in the function of the cartridge. See *KSR v Teleflex*: 82 USPQ 2d 1385 (2007).

Response to arguments of 10/10/07 traversing the rejection using Anderson:

Applicant's annotated version of Anderson's Figure 3 is copied below:

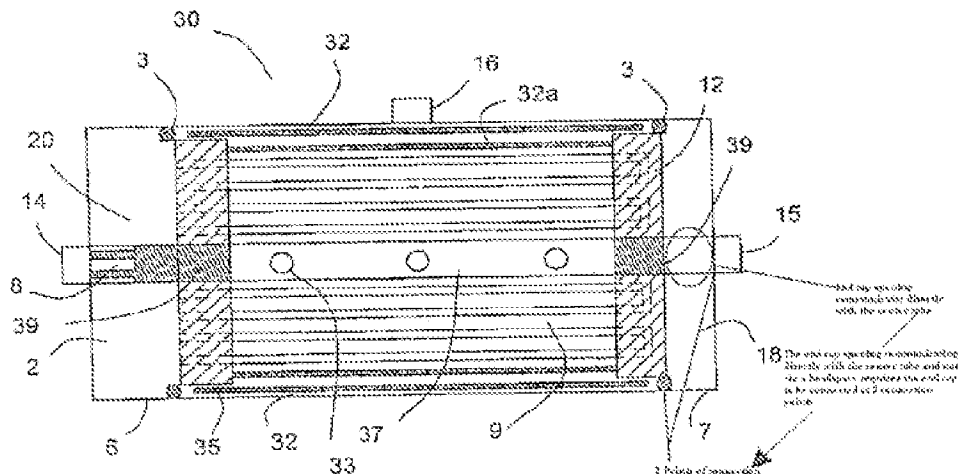


Fig. 3

Anderson provides the second head space as recited in the claims at the right end of the figure. Applicant's contention is that the center tube does not communicate with the second head space in Anderson because the center tube is shown as extending through the head space. Applicant further contends that this extension requires two joints for the end cap, as annotated in the figure 3.

Given a broadest reasonable interpretation of the claims, the Examiner believes that the construction of Anderson does teach the second head space, and the center tube as communicating with the end cap opening via the second head space. The extension of the center tube in Anderson is via (by way of, or through) the head space and through the opening of the end cap, and thus the opening of the end cap **is in communication** with **the center tube** via the head space.

The argument that two connection points require dual welding is not commensurate in scope with the claims.

(10) Response to Argument

VI. GROUND'S OF REJECTION TO BE REVIEWED ON APPEAL

Appellants have grouped independent claims 1,7,8 and 14 to stand or fall together and independent claims 19,20,21, and 22 to stand or fall together, and request they be considered separately because claims 1,7,8 and 14 include an additional element. However, appellants have not separately argued claims 1 and 19.

The additional element in claim 1 is the limitation: "*wherein said shell, said first end cap, said second end cap, said center tube, said first tube sheet, said second tube sheet, and said plug are made from a same material*". Since claim 19 is broader than claim 1, the examiner request that the Board consider claim 19 as representing.

Response to the General Arguments

There are only four points argued in the brief. They are:

(I) concerning all references:

(a) the second end cap requires two welded joints, first with the shell, and second with the central tube;

(b) the argument: "*Nowhere in the prior art is there a teaching, suggestion or reason for providing a second headspace that forces the opening in an end cap that needs to communicate with the center tube to communicate with the center tube via a headspace*"; [brief @16]

(II) concerning claim 1:

(c) end caps, tube, plug and tube sheets are **not** of the same material;

and (III) concerning the Kuzumoto reference:

(d) Kuzumoto does not have a seal between the second end cap and the second tube sheet.

Applicant also has submitted a declaration by Dr. Sengupta, one of the inventors, as purportedly showing unexpected results.

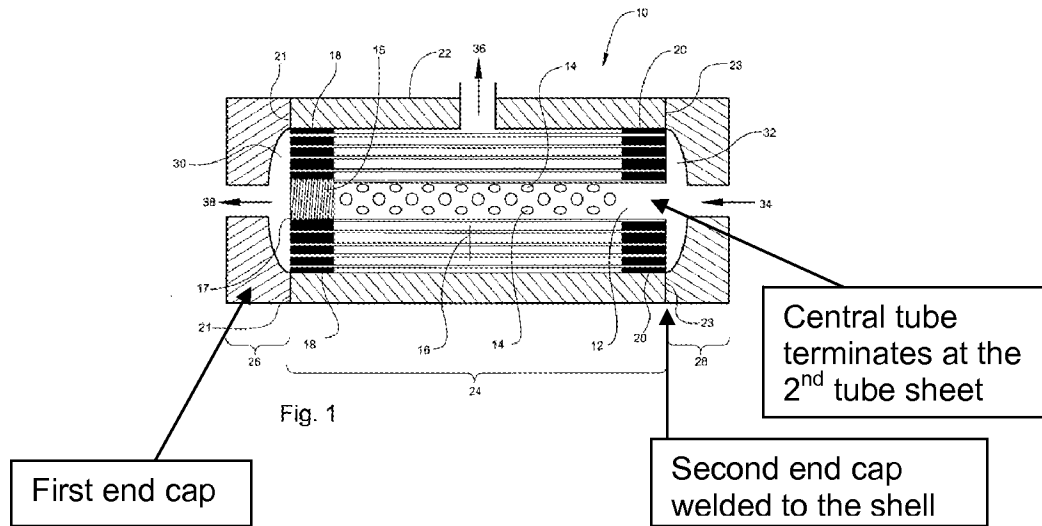
The argument specific to claim 1, that the end caps, tube sheets, the tube and the plug are not of the same material in the references is not accurate: Cho teaches using the same material for the entire hollow fiber membrane cartridge in column 1, lines 8-12. This is well known in the art; and is taught by Cho, and the reference incorporated by Cho (column 1 lines 8-12: US Patent 5,284,584: Huang et al: see abstract and column 1 lines 10-28 and column 5 lines 10-29: tube sheet, and other components of the cartridge made from polyolefin).

The argument regarding the dual welding, with the supporting declaration, is that the second end cap requires two simultaneous weldings or seals in the references, one with the shell and the other with the central tube. This is not commensurate in scope with the claims because there is no limitation in the claims to do with **welds**. This argument at best may support claims for the process of making the module by welding.

Regarding the argument that the end cap opening being not in communication with the center tube via the second head space, Appellants state in the brief (at page 16 and also at the footnote at page 17) that:

“However, for purposes of this appeal, the applicant will focus on one aspect of this configuration of a membrane contactor which permits the membrane contactor to be made without dual welding either end cap. Namely, the applicant will focus on the second headspace defined by the second end cap and the second tube sheet.”

In response, the Examiner submits that the “second headspace” along with the ‘second end cap’ are redundant, and do not serve any particular advantage. Appellants have not shown any criticality of these structures in the invention.



Applicant's Figure 1 is shown above. The second end cap, as annotated above, is welded to the shell, and forms a 'head space' (32) to the right of the second tube sheet. Applicant's design has the central tube terminating at the second tube sheet, and the line that brings in the feed (34) is to be connected to the opening of the second end cap. However, if this line is directly connected to the central tube or the central tube extended to connect to the feed line (such as taught by Kuzumoto or Anderson), then the second end cap (including the single weld) is not necessary; and it does not serve any purpose; and could be eliminated. The feed line (or pipe) must be connected to the central tube to use the module, which is easily accomplished by coupling to the center tube. Applicants also have not shown any criticality for the second head space, or why it is necessary. In both Anderson and Kuzumoto, the central tube is extended to

connect to the external piping, which will be explained in detail in the corresponding sections below. Note that the hollow fibers are closed at the second tube sheet.

Argument about the Kuzumoto not having a seal between the second tube sheet and the casing is addressed in that section below.

Regarding the Sengupta declaration:

It is abundantly clear from this declaration that the unexpected result is the elimination of 'simultaneous two step welding (paragraphs 13 and 14). However, this declaration is not commensurate in scope with the claims, because (1) claims are for a product; declaration helps only a process of making the product by welding at best, (2) there are no structural limitations in the claims directed at the welds, and (3) secondary references teach the changed orientation disclosed and claimed by the appellants.

Regarding Paragraphs 15 and 16 of the declaration, the unexpected result from the same material, is well known in the art and also taught by Cho.

A) CLAIMS 1, 3-8 AND 10-22 ARE NON-OBVIOUS UNDER 35 U.S.C. 103(a)
OVER CHO IN VIEW OF KUZUMOTO OR KUZUMOTO IN VIEW OF CHO

The arguments presented are (1) no reason to combine, (2) no teaching of 'end caps, tube, tube sheets and plug made of the same material', (3) Cho and Kuzumoto requires two simultaneous welding/seal for the second end cap, and (4) the resin layer of Kuzumoto is not sealed to the casing which makes it impossible for Kuzumoto to have the head space as defined in the claim.

(1) *No reason to combine*: Specifically, appellants argue that the references singly or in combination do not teach: “said second end cap being adjoined to said second end of said shell where said second end cap and said second tube sheet defining a second headspace therebetween; said second end cap opening being in communication with said center tube via said second head space;”

Reversing the orientation of the central tube in Cho (figure 4) would convert it to appellants’ design, except for the redundant second end cap and the corresponding headspace appellants provide. **The examiner does not believe that adding a part or structure that is not at all necessary and that does not have any particular function would make a claim patentable that is otherwise not patentable over the reference.** Thus the claimed invention is not patentable over the Cho reference. Moreover, this claimed structure which has the reversed orientation of the central tube over Cho is known in the prior arts, as was established by the references which taught this reversed arrangement, such as Kuzumoto and Anderson. Appellants are also focusing on a structure – the second headspace that is redundant and unnecessary - for patentability in this appeal [see page 16 and the footnote in page 17 of the brief].

With respect to Cho in view of Kuzumoto, Kuzumoto teaches the missing structures as claimed: as can be seen in Kuzumoto, figure 1, there is the second tube sheet 3’, a second end cap, and a headspace formed therebetween. Central tube 8 which extends to the outside through the opening in the second end cap through to tube 7 is in communication via the second headspace. Thus the Kuzumoto reference teaches that the structure claimed is known in the art. See *KSR Int’l. v. Teleflex Inc.*,

127 S. Ct. 1727, 1732, 82 USPQ2d 1385, 1390 (2007). “it is common sense that familiar items have obvious uses beyond their primary purposes, and a person of ordinary skill often will be able to fit the teachings of multiple patents together like pieces of a puzzle”, and “The combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results”.

In Kuzumoto in view of Cho, there is additional reason for combining as was clearly shown in the rejection: incorporation of Cho’s teachings into Kuzumoto’s teaching would afford better support and strength to the hollow fibers, as well as proper fiber spacing; choice of materials would provide better thermal and chemical resistance, etc.

(2) *No teaching of same material for the end caps, tube, tube sheets, plug, etc.* – this was shown not to be true above.

(3) Regarding the argument that Kuzumoto requires the end cap to be sealed to the module at two locations: first of all, this argument is not commensurate in scope with applicant’s claims, because there is no limitation in the claims that prevents such two seals. Secondly, the argument about the advantage in eliminating two simultaneous welds is also not commensurate in scope with the claims because such an advantage would be helpful only in the process of making the module. Thirdly, there no limitation in the claims that relate to welding or weldment.

(4) Argument that the resin layer (3') [sic] in Kuzumoto is not sealed to the casing
(1): This argument is not commensurate in scope with the rejection. This part of the structure is taught by Cho.

B) CLAIMS 1, 3-8 AND 10-22 ARE NON-OBVIOUS UNDER 35 U.S.C. 103(a)
OVER ANDERSON IN VIEW OF CHO OR CHO IN VIEW OF ANDERSON

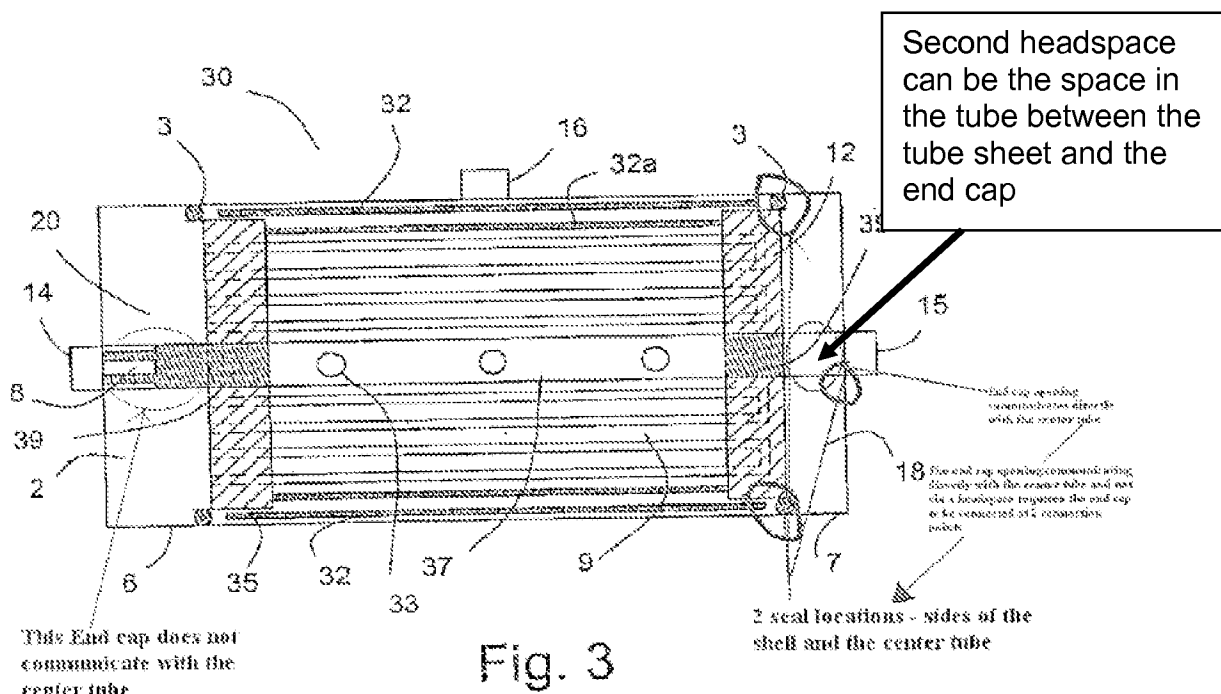
There are three points argued in this section:

- (1) No reason to combine,
- (2) there is no communication between the opening in the end cap and the central tube via the second headspace, and
- (3) the two simultaneous welding/seal requirement.

The argument:

See below an annotated Figure 3 of Anderson that illustrates how the end caps of Anderson communicate directly with the center tube and not via a headspace, thus, requiring the end caps to be sealed to the module at two locations.

Appellant's annotated picture of Anderson, Figure 3, is copied below and on it is shown the "second headspace", which by the broadest reasonable interpretation of the claims, can be within the tube itself.



As can be seen in this picture of Anderson (which is a schematic) annotated by the appellants, Anderson also teaches the redundant “second headspace” and the second end cap.

The “*requiring the end caps to be sealed to the module at two locations*” argument is not commensurate in scope with the claims. The claims are open-ended and do not further limit the number of seals required.

The argument about two simultaneous welding is also not commensurate in scope with the claims because claims do not have any limitation directed to weldments or welding, and moreover, that argument is directed at the process of making.

With respect to the argument that the opening of the end cap is not in communication with the center tube via the second headspace in Anderson: this is not

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accurate because the opening in the end cap of Anderson is in communication with the center tube via the head space, because the extension of the center tube passes through the head space. Moreover, the cavity within this extension of the center tube also is a headspace as claimed, because it is a space, and it is between the tube sheet and the end cap opening.

Regarding the reason to combine, the reasons have been provided in the rejection. One of ordinary skill in the art would combine the teaching of Anderson with that of Cho to modify Cho for applications as taught by Anderson; and one would modify Anderson with the teaching of Cho to have the fiber spacing, support and mechanical strength, as well as the thermal and chemical stability of the Cho designs. In addition, the change in orientation of the center tube with respect to Cho is taught by Anderson, which is also a known structure.

In conclusion, appellant's arguments traversing the rejections are not persuasive because the "same material" is taught by the Cho reference, the "second headspace" is a redundant part, and is taught by both Anderson and Kuzumoto, the "dual welding" is not commensurate in scope with the claims because the claims do not recite any specific structure related to welds, good reasons for combining the references as shown are given in the rejection, and even if not, the case law KSR teaches that it would be obvious to one of ordinary skill to combine the teachings of the references to obtain predictable results, and Dr. Sengupta's declaration is not commensurate in scope with the claims or the rejections.

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(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

/Krishnan S Menon/
Primary Examiner, Art Unit 1797

Conferees:

/David R. Sample/
Supervisory Patent Examiner, Art Unit 1797

/Duane S. Smith/
Supervisory Patent Examiner, Art Unit 1797